Chinook Salmon Spawning Season Flow Increases to Reduce Chinook Salmon Redd Superimposition

EWG-15A

September 24, 2003 EWG

PM&E Description

- Incrementally increase flows in the low flow channel from relatively low flows to relatively high flows throughout the Chinook salmon spawning season in order change the lateral spawning habitat distribution from center of river channel during the early portion of the spawning season to margins of river channel in the later portion of the spawning season.

PM&E Mode of Action

- Flows would be increased by some relatively consistent interval each week (for example, 25, 50, or 75 cfs/week) in order to increase usable spawning habitat and reduce superimposition of Chinook salmon redds.

PM&E Benefits

Increased quantity of Chinook salmon spawning habitat

- Increased quality of Chinook salmon spawning habitat
- Reduced redd superimposition of Chinook salmon redds
- Decreased Chinook salmon egg mortality

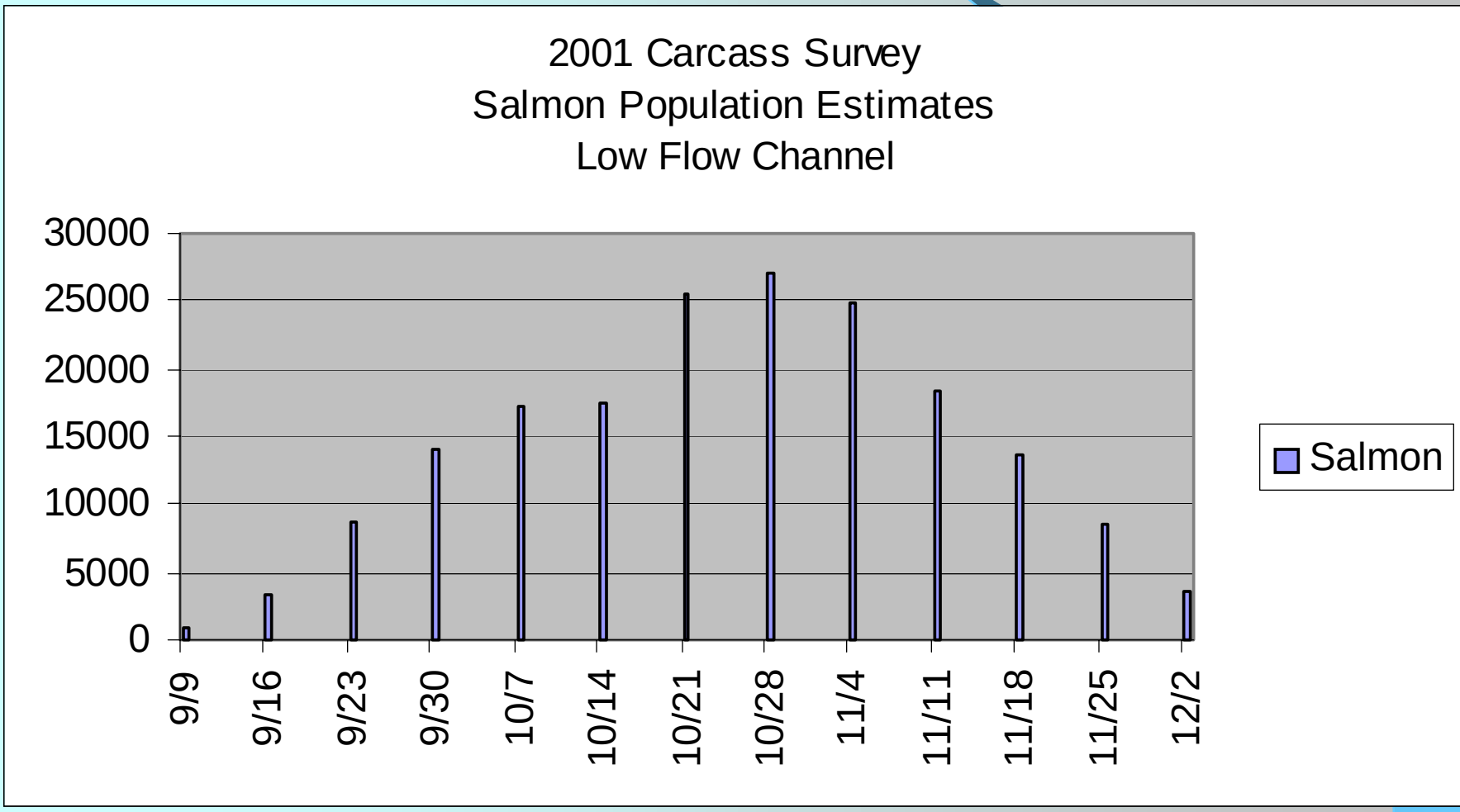
Background

- The low flow channel is heavily utilized by spawning adult Chinook salmon
- Intensive utilization of spawning habitat in the Low Flow Channel by adult Chinook salmon spawners results in redd superimposition
- Superimposition reduces egg survival

Background

- In 1995, the calculated superimposition index was 1.57 in the low flow channel and 0.47 in the high flow channel
- Peak of spawning activity in the Low Flow Channel occurs in approximately mid-October through mid-November
- Suitable spawning habitat is defined by substrate size, water temperature, depth and velocity

2001 Carcass Survey Salmon Population Estimates - Low Flow Channel



Design Considerations and Evaluation

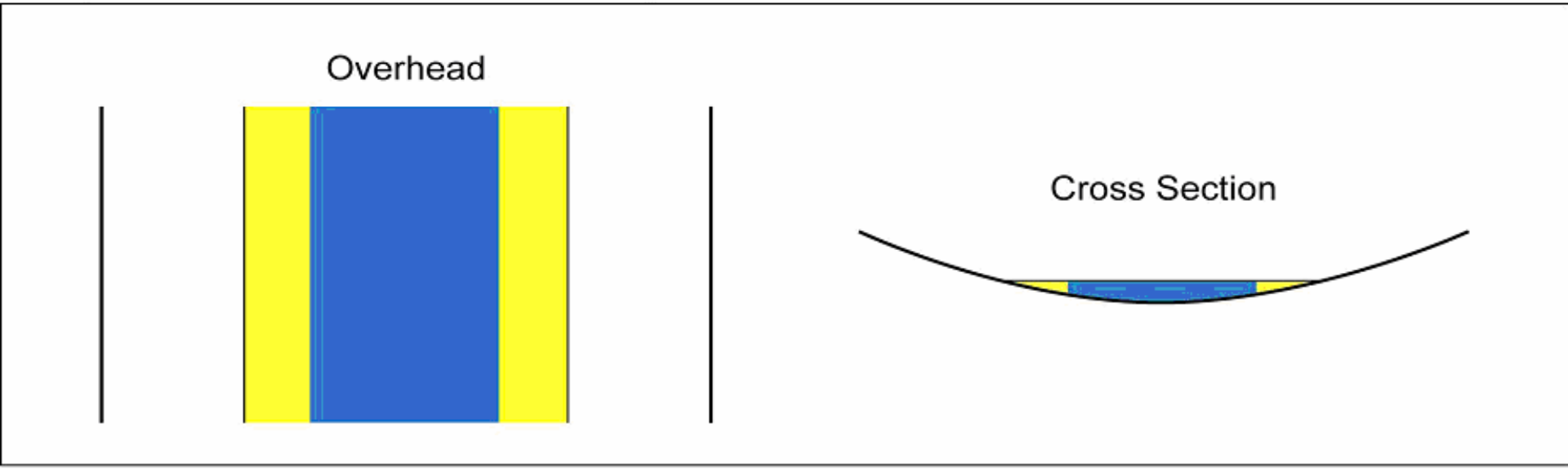
- Low flows during early part of the spawning season would require early Chinook salmon spawners to utilize the center portion of the river
- Potential water temperature limitations for early season low flows (spawning temperature suitability and water temperature compliance)
- Later spawners to would be forced to utilize suitable spawning habitat on the margins of the river

Design Considerations and Evaluation

- Upper limit of flow prescription may be constrained by potential scouring
- High flows would need to maintained through the end of May to be protective of steelhead
- Potential adverse impacts on availability and suitability of steelhead spawning habitat
- Power generation impacts

Conceptual Spawning Habitat Lateral Distribution

Early in Chinook salmon spawning season

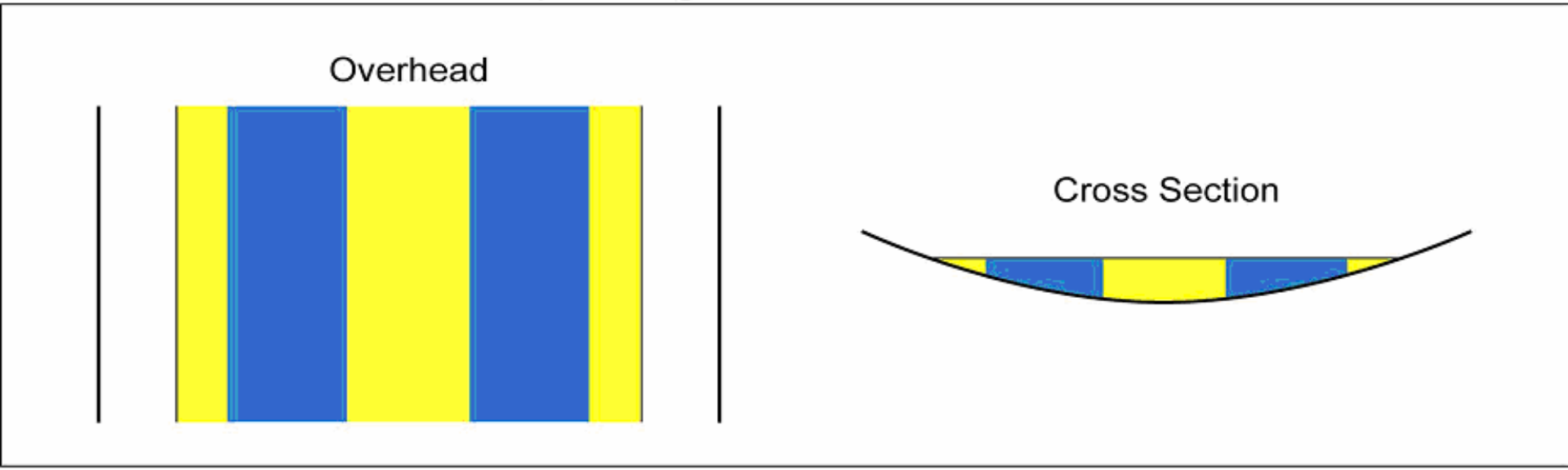


Suitable Depth and Velocity

Unsuitable Spawning Habitat

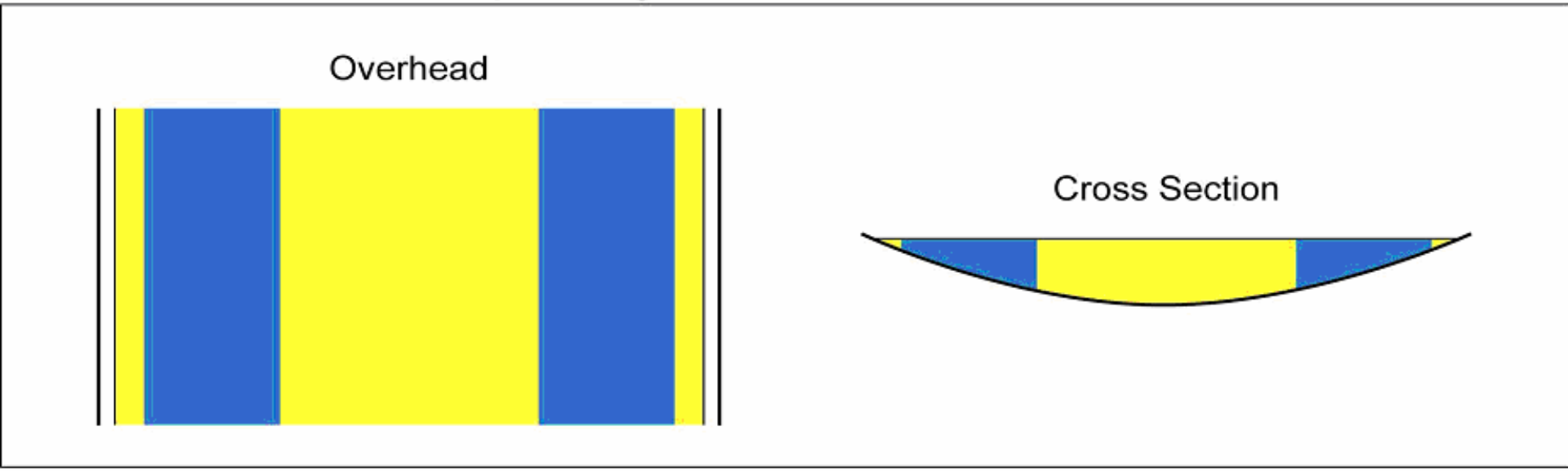
Conceptual Spawning Habitat Lateral Distribution

Middle in Chinook salmon spawning season



Conceptual Spawning Habitat Lateral Distribution

Late in Chinook salmon spawning season



Design Considerations and Evaluation

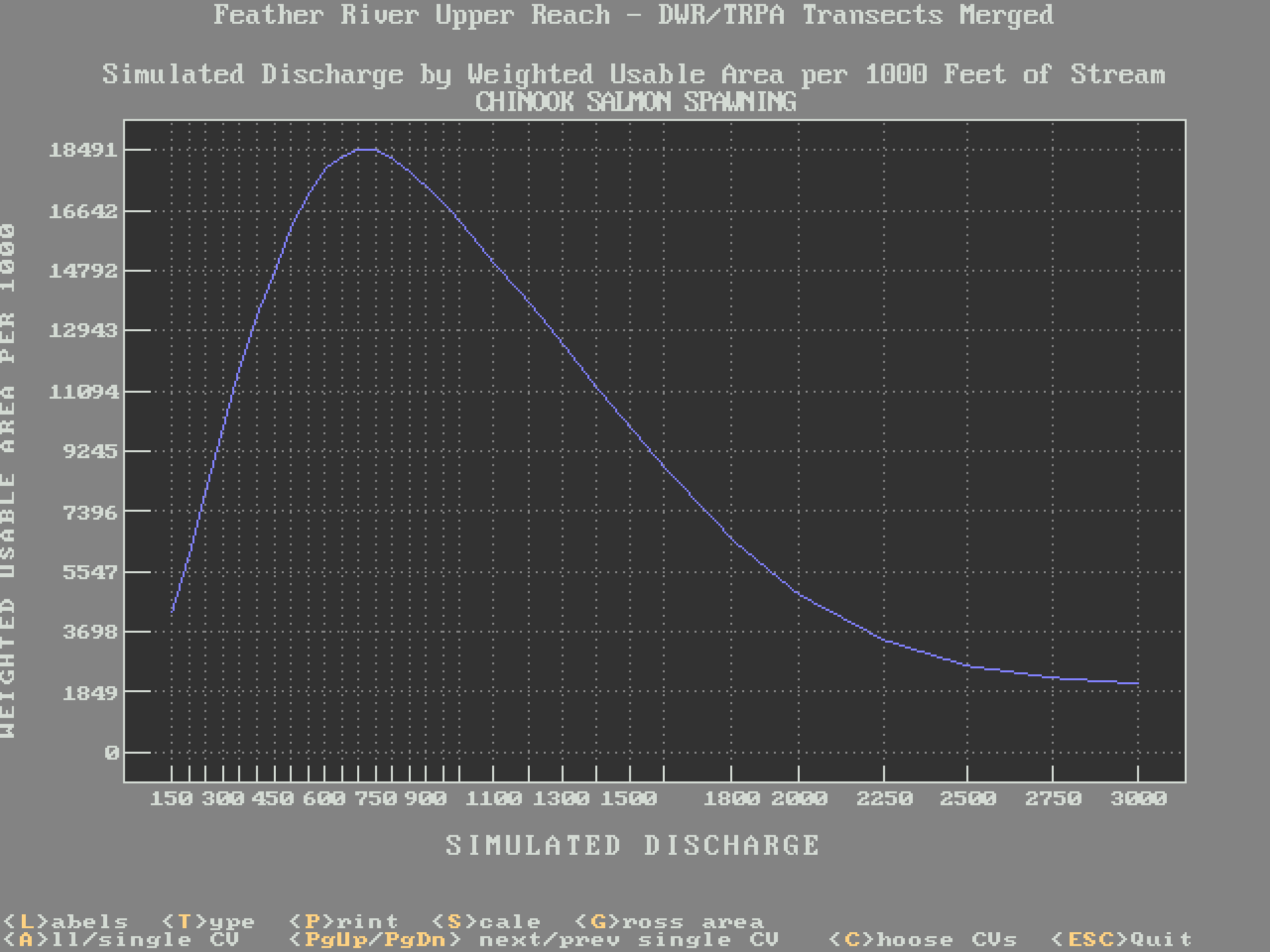
- Amount of suitable spawning habitat available with a flow regime should be balanced by the temporal distribution of the number of spawners and the amount of habitat required to support them
- The proposed flow regime should incorporate the objective to provide the maximum amount of suitable habitat at the peak of spawning activity

PHABSIM Evaluations of Potential Flow Prescriptions

- Would low flow targets provide adequate spawning quantity and quality of habitat for early spawners?
- How much spawning habitat would be created and lost for each increment of flow increase ?
- How much total spawning habitat would be created?
- Would the proposed flow manipulation result in changes to the lateral distribution of spawning habitat?

Evaluations of Potential Flow Prescriptions

- Based on modeled output of available spawning habitat from the PHABSIM, would the superimposition index be reduced?


Feather River Upper Reach - DWR/TRPA Transects Merged
Simulated Discharge by Weighted Usable Area per 1000 Feet of Stream
CHINOOK SALMON SPAWNING
WEIGHTED USABLE AREA PER 1000
18491
16642
14792
12943
11094
9245
7396
5547
3698
1849
0
150 300 450 600 750 900 1100 1300 1500 1800 2000 2250 2500 2750 3000
SIMULATED DISCHARGE
<L>abels <T>ype <P>rint <S>cale <G>ross area
<A>ll/single CV <PgUp/PgDn> next/prev single CV <C>hoose CVs <ESC>Quit

Recommendations

- Fisheries Task Force – Category 2
- Pending information:
  - PHABSIM results and evaluation
  - Areal extent of total spawning area delineated from aerial photographs - G2
  - Redd superimposition index calculation - SP-F10 Task 2B: Jan 2004
  - carcass survey data: SP-F10 Task 2B: final report Jan 2004